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MODERN STRAWBERRY GROWING

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The growing of strawberries is of widespread and increasing interest throughout Minnesota. We have suitable soils and climate, excellent markets, and a relative freedom from pests that are serious in some localities. From 1910 to 1920 there was a decrease of 16.5 per cent in acreage and of 30.8 per cent in yield in the United States, while in Minnesota there was an increase of 47.8 per cent in acreage and of 50 per cent in yield.

No home garden is complete without a generous assortment of small fruits. Any yard that has room for a vegetable garden can support a few berries, and probably no fruit is better adapted to limited garden space than are strawberries. They may be grown commercially on a small scale, as on a vacant lot, or on a large scale as a major farm department, occupying many acres. There is usually a satisfactory local market in any part of the northwest; and adjacent to Minnesota on the west is a large section of territory which will probably for many years depend chiefly upon outside sources for its supply of berries. Strawberry marketing is relatively easy, as berries are packed in standard boxes or crates that are acceptable on all markets.

There has been much talk recently about berries "running out" and some growers have abandoned the business for that reason. This mysterious ailment "running out" is really a running in instead. Wherever it is supposed to exist there can be found a running in of insects, diseases, and weeds. The only running out that occurs is a running out of the humus or organic matter in the soil as a result of continued cultivation year after year with no effort to maintain the supply with either barnyard manure or cover crops.

Modern berry culture is quite different from the berry growing of a few years ago. Perhaps the greatest difference is in plant restriction, or limitation of the fruiting area of the plants. No matter what variety is planted, some system of eliminating surplus wood or plants must be adopted if maximum crops and length of life of the patch are desired. So in the strawberry we find a narrowing of the rows and a destruction of late set runners advisable.

Thoro cultivation and hoeing should be practised continuously throughout the growing season, as maximum crops can be produced only under the most favorable cultural conditions. Neither hard packed ground nor weeds will allow the production of good crops.

The control of insects and diseases is becoming increasingly important and must not be neglected. The best control methods are clean cultivation and plant restriction, with prompt cutting out and burning of infected parts. In the control of some pests, spraying is necessary and it should be done thoroly and at the right time.

Before considering the culture of the strawberry, it will be well thoroly to understand the type of plant we are to deal with. There is a thick, fleshy crown which develops just at the ground level. From the lower part of the crown the roots grow, and from the upper part, the leaves, fruit stems, and runners. The crown and roots are perennial, the leaves and runners are annual, usually dying at the end of each growing season. The plant is propagated by means of runners—trailing stems that grow out from the crown, run along the ground, and at frequent intervals send down roots which produce new plants. These new plants are used to set out new plantations. In the matted-row system, the solid row is made up of the mother plants and the runner plants which grow from them. The strawberry roots are fine, fibrous, and short, the plants ordinarily not rooting more than a few inches deep. This means that the plant will have a very limited feeding range and for that reason the soil should be unusually rich in organic matter and well prepared.

VARIETIES

There are two types of strawberry blossoms; perfect or staminate, in which there are both stamens and pistils; and imperfect or pistillate, in which there are no stamens. The latter type is incapable of producing fruit unless pollinated from some other variety. Two or three rows of plants with imperfect flowers should be set to one row with perfect flowers. Care should be taken in the selection of these pollenizers, or perfect blossomed plants, to see that they bloom at the same time that the imperfect ones do and that they produce pollen abundantly.

There are also two types of strawberries, based on the time of fruiting—the common June bearing and the everbearing. The June bearing, sometimes called the standard strawberry, bears only one crop each year, in June and early July, and the first crop is borne the year after the plants are set. The everbearing varieties bear two crops a year, one at the same time as the June bearing varieties, and the second four or five weeks later, in late July or early August, continuing to fruit until heavy frosts have killed the blossoms and green berries in the fall. Everbearing varieties planted in the spring will produce an excellent crop of berries in the summer and fall of the same year. The second year they produce two crops, spring and fall, and if carried a third year, will do the same. However, it is seldom desirable to retain the everbearing more than two years. In some everbearing varieties the runner plants bear fruit the first year, while in others only the mother plant will fruit that season.

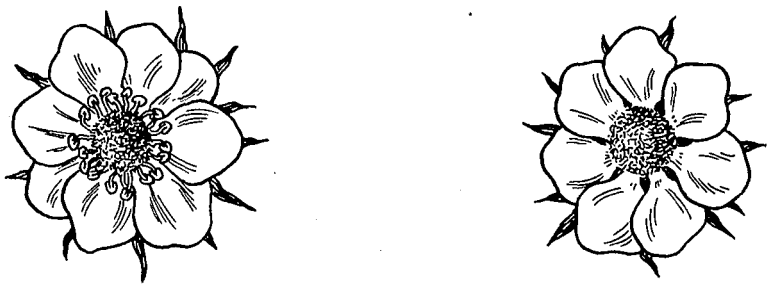

Fig. 1. Perfect and Imperfect Strawberry Blossoms

The perfect blossom (left) has both stamens and pistils. The imperfect (right) has no stamens and must be pollinated by a variety bearing perfect blossoms in order to bear fruit.

Choice of Varieties

The choice of varieties depends on whether the fruit is for market or home use. For home use it is desirable to have a long season of fresh fruit for the table with an abundant supply for canning at some one time in the season. High quality is important. For the market, varieties should be chosen that will produce most of their fruit when the price is highest, early in the season. The price is usually lowest in mid-season, with corresponding smaller profits for the grower; and higher again later in the summer. Heavy yielding ability, good shipping quality, attractive appearance, and ease of picking are four essentials for a good market berry. If the market is local, the shipping quality is not so important, but the berries should be firm enough to stand handling satisfactorily.

Leading Varieties

(In order of fruiting)

June bearing perfect varieties.—Premier: early, very promising, recommended for trial. The leading early berry in many sections. A heavy yielder. Berries large.

Dunlap: Mid-season. The most universally satisfactory berry we have at present.

Chaska, (Minn. No. 801): Mid-season. Ripens all its fruit at one time so that the entire crop may be harvested in two or three pickings.

Nokomis (Minn. No. 489): Mid-season. A heavy yielding and attractive berry, a little soft, excellent for home gardens and local market.

Minnehaha (Minn. No. 935): Late. A heavy yielding berry and an excellent shipper, probably the best late market strawberry.

June bearing, imperfect varieties.—Warfield: Mid-season, heavy yielding, good market berry.

Easypicker (Minn. No. 775): Mid-season, very high quality, berries dark red throughout. As the name implies, picked with great ease. Preferred by many to Warfield.

Everbearing Varieties

(In order of spring fruiting season)

Progressive: Very early spring crop. Berries medium in size, but produced in great abundance. It is the most generally satisfactory of the everbearing varieties.

Deephaven (Minn. No. 41): Mid-season. A new variety of great promise. Hardy and a heavy yielder.

Superb: Mid-season. Berries very large and attractive in appearance, but not produced in such abundance as Progressive. Very popular with some growers, but more exacting in soil requirements than Progressive.

Duluth (Minn. No. 1017): Late. Most popular with growers in the northern part of the state. Runner plants do not fruit the first year.

Location

The site for strawberry growing should be fairly level so that the soil will not wash, but a slight slope for ample water and air drainage is important. For early berries and for the everbearing variety, a south slope is preferable. For mid-season and late berries most growers select a northern slope. The north slope is cooler and more moist during the fruiting and growing season, and winter conditions are usually more satisfactory. Good water drainage is essential and if not present naturally, should be supplied by means of tile drains. Air

drainage is equally important and the site should be high enough to allow cold air to drain off readily to lower areas, thereby giving some protection from late spring and early fall frosts. The soil is more important than the site and the texture of the soil is more important than its fertility. Any good corn or potato land should be satisfactory for strawberries. A high organic content is very important. Most growers prefer a sandy loam or a medium loam top soil and a retentive but well drained subsoil. For early berries a light soil should be chosen, as two or three days earliness in ripening in the spring means a great deal in obtaining high prices. For late berries a heavier soil is desirable, as it tends to hold the berries back a little and is better supplied with moisture at the time that the berries are ripening. If irrigation is practised a somewhat sandy soil is preferable.

Many growers are rasing strawberries successfully on low-land soils, as peat. When properly handled, an excellent stand of plants is secured and usually a large yield of fruit. The great danger in using low land is that untimely frosts may ruin the crop.

Preparation of Soil

Wherever possible a thoroly cultivated crop should precede the strawberries, as the weeds will be fairly well killed out and the soil put in good physical condition. Sod land should be avoided because of danger from grub worms and cutworms. Heavy applications of barnyard manure should be made before plowing. Many prefer to apply the manure a year before the berries are to be planted. The land should be disked before plowing and plowing should be deep, eight or ten inches if the soil will stand it. Fall plowing is preferable to spring plowing. As early in spring as the ground is tillable, it should be worked into an ideal seedbed by thoro disking and harrowing. Just before planting, the soil should be planked if it is heavy, or rolled if it is light.

Fertilization.—Strawberries need an abundant supply of plant food. Barnyard manure, somewhat rotted, is the best material, for it adds nitrogen, phosphorus, and potash and in addition builds up the organic content of the soil. There is sometimes danger in using very old manure because of the possibility of introducing grub worms into the soil.. If manure containing grub worms is used it should be put on late in the fall after the ground is frozen. Exposure during the winter will usually kill the worms. Applications of 15 to 20 tons per acre before plowing are considered about the right amount by many growers. Rotted barnyard manure is often worked into the soil during the growing season, especially for everbearing strawberries. If a good supply of barnyard manure is not available or if land is not

too high in price, the use of green manures to build up the organic content of the soil and to add to the nitrogen supply (if a legume is used) is advisable. In the four- and five-year rotations, given later, green manures play a very important part.

Planting Time

With very few exceptions the best time to plant strawberries is in the early spring. They should be set as early as the ground can be worked into proper condition and as soon as well started plants are procurable. It is best not to use plants entirely dormant, but to wait until they have started growth and their vigor is obvious; but in the central section of the state, plants put out after May 10 have a severe handicap. Late summer and fall planting is practiced by some if an abundant supply of moisture is available or if artificial watering can be done. It is, however, a very doubtful practice and should not be followed if spring planting is possible.

Training Systems

There are two main systems of strawberry growing, the hill and the matted row, with many intermediate modifications and variations. In the hill system the plants are set fairly close together and no runners are allowed to develop. The crowns then stool out, producing large multiple crowns, and the mother plants become very large. This system is especially suited to some varieties of June berries and to the everbearing berries under certain conditions. It is an excellent plan for everbearing strawberries in the home garden and is used by many growers who have special or fancy markets. A large percentage of the southern and western strawberries are grown in this way, but at present it is a relatively unimportant method in the north. Its advantages are that it produces uniformly large berries of even size and makes a plantation that is very easily weeded and picked. The disadvantages are the larger number of plants required to plant an acre, entailing a large cost for plants, for setting, and for cultivation early in the season; and the large amount of labor required to cut the runners. The plants are usually set so that they may be cross-cultivated with either a wheel hoe or a horse cultivator, thus eliminating much of the extra labor. The hill system may pay on special markets, but should be tried on a small scale first. The usual planting distances are as follows:

12 to 18 inches in the row by 2½ to 3 feet between rows for horse cultivation one way.

12 to 15 inches in the row by 18 to 24 inches between rows for all hand or wheel-hoe cultivation.

24 inches in the row by 24 to 30 inches between rows for cultivating both ways with a horse.

Matted Row System

In the matted-row system the runners are allowed to develop in all directions from the mother plant. They take root and form a solid mat of plants. The rows vary in width from only 12 inches, about the spread of the mother plant's foliage, to 4 feet or more. It is seldom profitable, however, to let the rows grow more than 3 feet, and under ordinary conditions the most profitable production comes from rows between 18 and 24 inches wide. The common planting plans are:

15 to 18 inches apart in the row by 3 to 4 feet between rows for the very narrow mat, especially for the everbearing varieties.

18 to 24 inches apart in the row by 4 to 5 feet between rows for the wide mat row.

Probably the best average is 24 inches apart, in rows 4 feet apart, and allow them to develop a mat 20 to 24 inches wide, after which all runners are cut off. The objection to the wider row is that plants will set too thickly and many of the later rooting ones will not produce fruit, and will become in effect simply weeds. Plants in a wide matted row should be thinned to a minimum spacing of 6 inches apart for best production. There are several methods of thinning, the most accurate and most expensive of which is to thin them out with a hoe. Some growers drag and cross-drag the field with a spike-toothed harrow at the end of the season's growth. This treatment will injure few, if any, of the well established plants, but will tear out a great many of the late rooted and crowding plants. In the narrow matted row, thinning is not so necessary and usually is not practiced.

Hedge Row System

There are several hedge row systems, all of which entail the definite placing of a certain number of runners from each plant, whether the number be 2, 4, or 6, after which all later runners are cut off. This system has few advantages over the narrow mat and requires a great deal of careful work. It is little used and is not recommended for Minnesota.

HANDLING STOCK

Probably one of the most common causes for failure to get a good stand is careless handling of the plants from the time they arrive from the nursery until they are planted. When unpacking, run the hand in among the bunches of plants and if they are cool and moist it will be all right to leave them in the package in a cool place, as the vegetable cellar, for a few hours. If hot and dry, they should be unpacked at once, the bunches opened, and the roots puddled in muddy water. Then they should be heeled in, in a cool shady place. Never water plants in the package. Heeling in should be done as carefully as planting, for it is a temporary planting. The crown should be held at the ground line and moist soil drawn about the roots and well firmed. They should then be watered and protected from wind and sun. If they are kept heeled in for any considerable time, they should be watered at frequent intervals. Plants that are in very poor condition upon arrival may be saved by this treatment. Even if the plants are in perfect condition, if they are not to be planted within a few hours after arrival, they should be heeled in. Careless heeling in will ruin even plants that are in perfect condition.

Pruning

Generally, strawberry plants need to be pruned before they are planted. If they are to be heeled in, pruning should be done before the heeling in and is usually done while the plants are in the original bunch. The amount of pruning depends on the time of year, the development of the plant, and the conditions of soil and weather. Part of the leaves are removed to reduce transpiration before the roots become established. Early in the spring, when the leaves are few and small, little leaf pruning is necessary. Later, when there are several large leaves, remove all but one or two, cutting the stems at the crown with a knife. There is more danger of cutting off too few leaves than too many. Any blossom buds and all dead leaves and runners should be removed. The roots are usually shortened about one-fourth or one-fifth of their length, leaving them between 4 and 5 inches long. This removes frayed and injured ends and makes the roots easier to spread when planting.

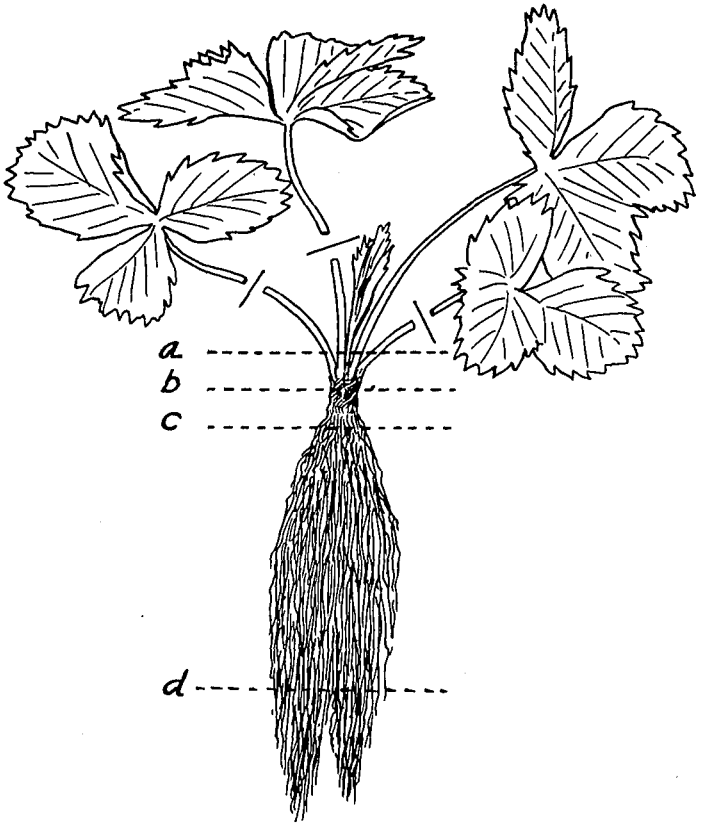

Fig. 2. Strawberry Plant Showing Pruning and Depth of Planting

a. Planted too deep.
b. Planted correctly.
c. Planted too shallow.
d. Pruning of root.

Planting

Any good live strawberry plant should grow if properly handled and if planted in a well prepared soil. **It must at no time suffer from lack of moisture. If that one fact is kept in mind all through the handling and setting of the plants, the results should be satisfactory.** The ground should be stirred just before planting in order to kill weeds and to conserve moisture. Then it should be planked or rolled, as mentioned above, and marked. An adjustable marker of the sled type is commonly used. Many growers prefer to mark both ways, as that allows cross-cultivation until the plants begin to run. If possible, a cool, cloudy, moist day, on which there is little wind, should be selected for planting; at least, days with hot, drying winds should be avoided. Take the plants out of the crate or out of the ground, if they are heeled in, only as needed in the field.

Puddle the roots as they are taken up and carry the plants in a pail with some muddy water in the bottom. This should be covered to protect them from sun and wind. Drop the plants in the holes only a short distance ahead of the planter. Two essential precautions must be observed: (1) The plants must be set with the ground line at about the center of the crown, and (2) the roots must be well spread and have firm contact with moist soil. If the ground is dry and dusty on top, it is well to scrape the dust off before planting so that it will not get into the hole and help to dry out the roots.

There are several planting methods. Some use a dibber, but unless a wide dibber is used roots will not have room to spread sufficiently. Some use a spade, one person pushing the spade into the ground to a depth of about 6 inches, then pushing it forward, leaving an opening in which a second person places the plant. The first person then withdraws the spade, places it in the ground a few inches forward and pulls it toward the plant, in this manner firming the soil against the plant. One of the most satisfactory methods is to dig a small hole with a spade, cutting straight down on one side and mounding the loose soil at the opposite edge of the hole. The deepest part of the hole, at the base of the straight cut, should be 6 or 7 inches deep. The plant is held against the straight cut, which is moist soil in which there is good capillary moisture movement. The center of the crown is placed at the ground line and the roots are spread fan-shaped against the firm, moist soil. The loose moist soil is then drawn against the roots and **firmed well,** the surface leveled, and loose soil left on top.

If the crown is placed too deep the plant will suffocate, and if not deep enough it will dry out. If the soil is not well firmed about the roots the leaves will wilt and the plant will soon die.

Culture the First Year

Cultivation should be started immediately after planting, the same day if possible. It should be frequent and shallow, preferably using a cultivator with fine teeth, as it keeps the soil fine and level. Cultivation should be given every ten days and after every rain, and should be continued until the end of September. A spike-toothed cultivator with from 11 to 14 teeth is one of the best horse implements. From the time the plant is set until the runners start to grow, a wheel hoe straddling the rows of plants will eliminate a great deal of hand labor and will accomplish the work satisfactorily in a very short time. After the plants begin to run, the hand hoe must be used between the plants to maintain a dust mulch and keep down the weeds. All blossome should be kept off the June bearing plants the first year and off

the everbearing plants until the first week in July, when they may be allowed to set fruit. Early in the season the runners should be worked into the row, either with the cultivator or by hand, and turned to fill in any vacancies. All runners are kept off plants grown in the hill system during the entire year. Later, when the rows have reached the desired width in the mat system, additional runners are cut off. The runners are usually cut with a sharpened disk about eight inches in diameter, called a runner cutter. This may be attached to the horse cultivator and the runners cut at the same time that the cultivating is done; or in a small patch the cutter may be put on a handle and the runners cut by hand. When the runner cutter is not used, the work is done with a hoe.

Winter Protection

Strawberries should be well mulched with straw or other material for winter protection. In some years the plants will come through uninjured without any protection, but usually some are killed and many are injured unless they are covered. The mulch is necessary up to and during the picking season, so the more logical plan is to apply it in the fall. The usual time for application is in the fall after all growth has stopped and cold weather has come to stay. It is customary to wait until the ground is frozen so that it will bear the wagon with the straw load, but the patch may be covered earlier if all warm weather is past. The purposes of the mulch are:

1. To prevent alternate freezing and thawing of the ground during late fall, winter, and early spring.

2. To prevent drying out of the plants during the winter.

3. To prevent too early starting in the spring, which might be followed by injury to the blossoms.

4. The straw, after adjustment in spring, is available for frost protection in case of late killing frosts.

5. The mulch conserves the moisture from the time the plants are uncovered until the berries have been picked.

6. It keeps down the weeds during that time.

7. It keeps the berries clean and makes a clean place for pickers to work.

The most common material is straw, wheat straw being desirable when obtainable. The ideal mulch material should be free from weeds; should spread evenly on the ground; should not be blown off easily; should not pack too tightly, keeping out the air; and should contain some fine material which can be worked in around the plants. Sometimes strawy manure is used. Many growers prefer short marsh hay because it covers well and is free from weed seeds. Long coarse

marsh hay is not desirable because it does not make a very tight mulch and because it blows very easily. Cornstalks are poor, but are satisfactory if shredded. The average amount of mulching material used is 2 or 3 inches. A common rule is to cover the plants so that all foliage is hidden and then put on a little more for good measure. In the western part of the state and in the prairie districts a heavier mulch should be given.

Fig. 3. Wide Matted Row in Bloom, Showing Disposition of Mulch in Alleys

Culture the Second Year

The straw mulch should be removed or adjusted early in the spring, at least before any considerable growth has been made. For early berries it is best to remove part of the mulch as soon as the ground is thawed out. Just enough should be taken off from directly over the plants to allow the plants to grow through, the straw which is removed being left in the aisle on top of the straw already there. If the straw is left on until after the plants begin to grow, more will have to be taken off than if it is removed earlier. Never allow the plants to grow until they begin to be white before loosening the straw. This work is sometimes done with the hands, the person crawling along on hands and knees. Less careful work is done with a four- or five-tined fork or a wooden hay rake. If there is danger of the mulch blowing about the patch, it may be held in place by a forkful of dirt at frequent intervals. From this time until the harvest of the berries no other attention need be given the patch other than pulling out by hand any weeds which may come up through the mulch.

Harvesting the Crop

In picking the berries they should be handled with extreme care, for any break in the skin will be followed by rapid molding or spoiling. Berries should never be squeezed, or dropped or tossed into the box, and never should more berries be held in the hand than will rest there without any grasping. Fruits deteriorate more rapidly after they have been picked than they do on the vine, especially if left in the sun. They should be taken into a shady, cool place as soon as possible after picking. The berries are usually put into quart boxes, altho the fall crop is commonly put into pint boxes. The pickers are furnished carriers or trays holding six boxes, and having a handle. In this part of the country grading or sorting is done as they are picked, small, rough, very ripe, or otherwise undesirable berries being put in a separate box or thrown away. The stem should never be separated from the berry. Stems about half an inch in length make the most attractive package. Berries for a distant market are picked when three-fourths or four-fifths red, still showing a white tip. For local market they may be allowed to color fully. The box should be well heaped and, as soon as a carrier is full, it should be taken to a shady place at the side of the field, usually a packing shed, and the box put into the 16- or 24-quart crate.

Treatment of Bed After Harvest

The usual practice is to gather fruit from a patch of June bearing strawberry plants only two years. In sections where insects and diseases are very severe, it is best to take only one crop, and plow up the patch as soon as it is picked. If a second crop is to be grown, the old bed should be renewed or renovated. There are three main steps:

1. The destroying of old foliage and part of the mulch in order to control insects and diseases.

2. The narrowing of the rows if they are more than 12 inches wide.

3. The loosening up of the soil in the aisle.

There are several different methods of renewal. This is perhaps the most common and most generally satisfactory: First mow the foliage, using an ordinary mower on a large patch, or a scythe on a small one. When thoroly dry, the foliage and mulch may be burned right on the patch, as the flames will pass over the plants quickly and there will be little or no injury to the crowns. If conditions are not favorable for this, the leaves should be raked up and hauled off the field and burned elsewhere. A turning plow is then run along

each side of the rows, narrowing the row of plants to 8 to 12 inches, throwing up a back furrow in the center of the aisle. If manure is to be applied it should be put on at this time, putting it in the furrows thus formed. The next step is to work these ridges or back furrows down with a heavy cultivator or a common spike-toothed harrow, with the teeth slightly slanting. When the furrows are well filled, the field is harrowed and cross-harrowed in order to level the ground and to work a little new soil over the rows of plants. Then a heavy cultivator is run down the aisles to loosen the soil in the center. Some use a heavy cultivator instead of the plow for the first loosening of the soil. Following this, the row itself is hoed to destroy weak plants and any weeds which may persist. In the hill system, the foliage is cut and destroyed as above and the soil loosened with a heavy cultivator, omitting the plowing. Some soil should be worked over the old crowns. The rest of the year the patch is treated exactly as is the one-year-old bed, receiving thoro cultivation and a winter protection of straw late in the fall.

Culture the Third Year

The care and handling of the strawberry patch the third year is identical with that of the second year until the crop has been harvested. Then the usual and the safest plan is to plow up the entire field. Some growers prefer to renew the patch again and take a third crop, but this is a very dangerous procedure because it is likely to induce much trouble from insects and diseases and the crop is usually unsatisfactory. The old patch should be plowed under as soon as possible after the second crop has been picked. If strawberry leaf-rollers are prevalent, it may be best to mow the patch and burn the foliage after drying, before plowing, but ordinarily this is not necessary. The depth of plowing depends on the subsequent treatment to be given the patch. A green manure crop or late vegetable crop may be planted as soon as the ground can be worked into good condition. As this plowing usually is done by the end of the first week in July, there is ample time to obtain a good growth of green manure, which is of great importance in building up and maintaining the humus supply in the soil.

The Fourth Year

The fourth year there should be no strawberries on the field. A green manure or vegetable crop, or a combination of the two, may be used. If the land is being farmed intensively and strawberries are to be again grown on the same field, the condition of the soil for following strawberry crops should determine what crops will be grown.

On any but the most high priced land, a green manure crop should be grown between the plowing up of the first bed and the planting of the second.

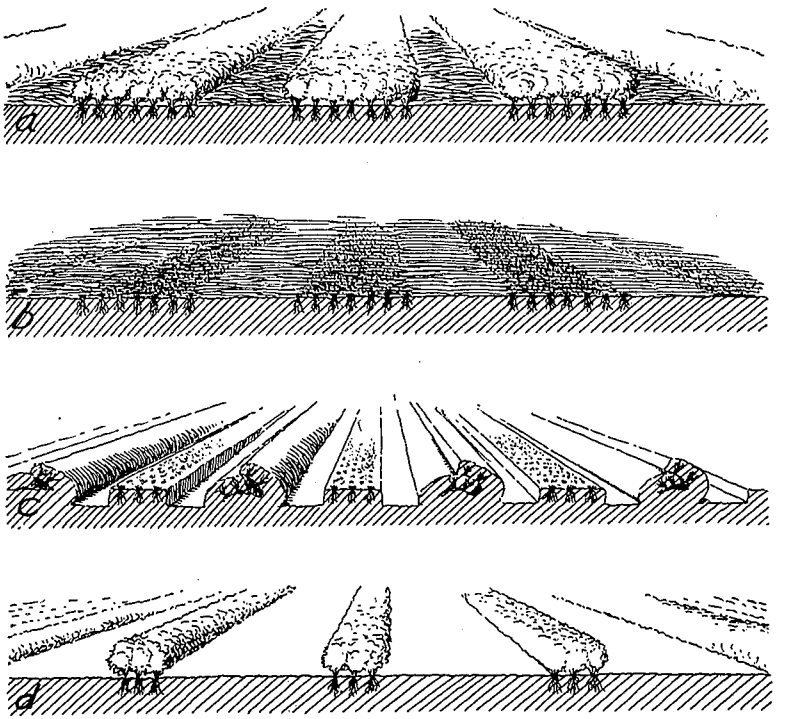

Fig. 4. Renovation of Old Strawberry Bed

a. Matted rows and mulch before treatment.
b. Tops cut and burned with most of mulch.
c. A strip plowed under at each side of the matted row.
d. Healthy new foliage growing from renovated plants.

Rotations

Most strawberry growers follow a very definite plan of rotation. Two common and very satisfactory plans are given, one covering four years and another five years, the latter being better suited to cheaper land than the former.

Four-year rotation.—First year. Plants are set. In intensive culture, a companion crop may be grown between the strawberry rows during the first two months, using small crops—turnips, radishes, etc.

Second year. A first crop is picked and the patch is renewed.

Third year. Second crop is picked, patch is plowed under, and a green manure or late vegetable crop is planted.

Fourth year. A green manure crop or vegetable crop, or both, may be grown. The land is plowed in the fall in preparation for the strawberries the following spring.

Fifth year. Same as the first.

Five-year rotation.—First year. Same as in the four-year rotation.

Second year. Same as in the four-year rotation.

Third year. Second crop picked and patch plowed under. Winter rye planted.

Fourth year. Clover seed is planted on the rye. The rye is cut and if one is not equipped to handle grain crops it may be cut before heading and left to be plowed into the soil or raked up to be used for mulch on other strawberry patches.

Fifth year. Let the first crop of clover lie on the ground. A second crop of clover is cut and left on the field or plowed under before it seeds, the ground being plowed in preparation for strawberries to be set the following year. This five-year rotation is especially desirable where manure is difficult to obtain for it builds up both the organic content and the nitrogen content of the soil.

EVERBEARING OR FALL BEARING STRAWBERRIES

Everbearing strawberries are practically the same as spring bearing except that they have two seasons of fruiting each year. This fruiting habit makes necessary some changes in planting distances and cultural practices, chiefly because of the greater need for available food and moisture. The plants are ordinarily grown in a mat from 12 to 15 inches wide or in the hill system, and the plants are usually set a little closer in the row and the rows a little nearer together than for the spring bearing varieties.

Culture the first year.—The culture the first year is the same as with the spring bearing varieties except that blossom cutting is necessarily kept up for a longer period, for in a short time after the normal spring blossoms have been removed, it is again necessary to cut off the blossoms which appear for the summer or fall crop. This should be kept up at least until the first of July. It allows the plants to build up a better root and fruiting system and results in a much better late summer and fall crop than if the early blossoms had been allowed to fruit. They should seldom be removed after the middle of July. As the runners begin to blossom heavily early in July, the work of removing blossoms after this time becomes very tedious and is usually not done. It is often advantageous to mulch the plants early in August, in the hill system. In the narrow mat system, the

mulch is sometimes worked in among the plants, an aisle being left for cultivation, and at other times the whole bed is mulched. Lawn clippings, when available, are excellent for working in among the plants. Well rotted manure, when finely pulverized, is good, but should be covered with some other material, as lawn clippings or straw. The mulch should be very heavy if cultivation is to be done away with entirely. The winter covering is the same as for spring bearing varieties.

Culture the second year.—The patch is handled the same as for the June bearing varieties until after the June crop is picked. In the renewal, the foliage should not be cut unless leaf-rollers are abundant. Plowing and cultivating are confined to the aisle, no plants being destroyed, for the rows are narrow and the same plants will produce another crop in a few weeks. The ground should be heavily fertilized with well rotted manure at this time and cultivation should be thoro and frequent. In a few weeks the fall crop will appear and then the treatment is the same as in the previous year, the application of the mulch at this time being, if anything, more common than in the first year. Many growers plow up their patches at the end of the second year, but if the field is in good condition it may be carried over for a third year. It must be remembered, however, that with this long continued production, an abundant supply of available plant food and moisture must be maintained if satisfactory crops are to be produced.

Everbearing strawberries need better care, better culture, heavier fertilization, and more careful spacing and thinning of plants than do June-bearing varieties, as they produce over a much longer season and the bulk of the crop is produced at a time of the year when less natural moisture is available and the weather is warmer. However, when given the proper attention, there is no small fruit which will give greater satisfaction, especially as a home garden berry.

STRAWBERRY INSECTS

Strawberry weevil.—The strawberry weevil is a small beetle which lays its eggs in the blossom bud of the strawberry. After depositing the egg in the bud the female cuts the stem off, or nearly off, just below the bud. The injury from this insect may be very severe, at times resulting in the loss of even 90 per cent of the crop. The best control measure is a short rotation in which only one or two crops are taken from a bed of June bearing varieties. The old beds are plowed up immediately after picking the last crop and the land is put into some other crop for a year or two. New beds should be as far from the old ones as is convenient. Spraying has not been

shown to be effective, altho in some localities a dust of sulphur and arsenate of lead has helped to control the insect. Burning over all the beds after the crop is picked, and thoroly working the ground at renewal will help to control the pest, but the patch should not be carried for more than two crops if the insects are abundant.

Strawberry leaf-roller.—The strawberry leaf-roller does its damage when in the larval stage. The egg is deposited by the adult, a little brown moth, near the base of the midrib of the strawberry leaf. Upon hatching, the larva spins a small web, drawing the two halves of the leaf together, and feeds on the inner surface. After the leaves have been folded, spraying is of no avail, but spraying with arsenate of lead as soon as the insects begin to work and before the leaf is folded may be effective. Prompt mowing and burning of the foliage as soon as the crop has been picked is also a good method. With the everbearing variety this can not be done satisfactorily, so a thoro spraying with arsenate of lead should be given just before the spring crop is ready to harvest and one or two more applications as may be necessary, between the harvesting of the spring crop and the beginning of the fall crop.

STRAWBERRY DISEASES

Leaf blight.—Strawberry leaf blight first appears as small round spots, reddish or purplish brown in color. These increase until from ⅛ to ¼ of an inch in diameter, their centers becoming gray as the size increases and a purple border appearing about the edge. The spots first appear about the time fruit sets. Unless control measures are taken, the disease may become very serious, the spots becoming so numerous as to kill the entire leaf. The result may be a decreased production of fruit. In some cases the stem is affected and the berries fail to mature. A fair control is obtained from spraying with 4-4-50 bordeaux mixture applied just before the blossoms open and once or twice, as necessary, after the fruit is picked. Destruction of infected leaves will help to check the spread and all infected leaves should be removed from young plants that are set out.